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Skills in European higher education mobility programmes: outlining a conceptual framework

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Abstract

Purpose – Credit mobility has been acknowledged not only to broaden personal and intellectual horizons but also to have positive effects on the skills development and employability of undergraduate students. Academics, policymakers and organizations representing the labour market have presented a broad number of skills-related explorations proposing different frameworks to help develop students' skills. However, the identification of explicit skills is still a difficult endeavour. This study aims to revise main conceptual skills frameworks applicable in the European higher education area (EHEA), determine the skills relevant in European credit mobility and categorize skills among the examined schemes in order to create a normative model of the skills students should obtain in exchange programmes.

Design/methodology/approach – The approach used to identify related literature was a search in three main databases such as Scopus, Web of Science and Google Scholar for scientific and relevant articles after 1990 using the following combination of keywords: "skill frameworks" AND "higher education" OR "skill frameworks" AND "mobility exchange programs". It produced 391 articles but only 32 deal with skill frameworks in European higher education. After the review of these existing literature (summaries, tables and conclusions), we found out that most articles focused on specific skills (transferable, employable, etc.) in the EHEA, but merely 16 academic publications offered a complete depiction of skills frameworks applicable in credit mobility programs. Most current accounts about skills outlines, specifically the ones related to employability, come from grey literature, namely comprehensive records and reports.

Findings – Data seem to confirm that there is scarce agreement on a common taxonomy of skills. However, considering the results, which summarize relevant educational, institutional and occupational perspectives, it can be noticed that there is consensus on the classification of only four skills: ICT, literacy and numeracy, which are considered basic, key or core skills in most researched papers together with problem solving, which is generally regarded as a cognitive skill. The general tendency is that policymakers and academia focus on some particular domains: basic/key, core/global foundation/fundamental skills, transferable, transversal and other skills. Studies analysing the workforce skill requirements have projected mainly cognitive and learning skills, whereas mobility programmes concede relevance to employability, management, career and life skills.

Research limitations/implications – Measuring skills involves limitations as records vary depending on continuous emerging data from institutions, occupations and education. The key frameworks surveyed have provided a representative classification and depiction of the current skills from specific perspectives which are also believed to have their shortcomings. In combination, however, it is believed that the results presented can help provide a theoretical basis for assessing skills in credit mobility and Erasmus programmes within the EHEA. The resulting framework presents a founded basis for skills appraisal which expects to be meaningful for various stakeholders and helps determine how mobility policies can help improve the attainment of skills in the EHEA.

Practical implications – Research has suggested that education systems will have to adapt to the changing needs of the labour markets' reshaping roles to balance technology and human intellect. The workforce seems to realize that cognitive skills such as problem solving, organization and decision-making are needed in today's society; advanced basic learning skills such as numeracy and literacy are essential. Findings appoint to new areas for exploration in skills development in order to prepare European higher education students for current trends in the Fourth Industrial Revolution and the fusion between digital, physical and biological spheres.

Social implications – Data seem to confirm that a sole degree does not guarantee success, but the maturity of certain skills and the commitment to lifelong learning. This can be strengthened by taking part in EHEA credit

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student mobility that has proved to improve not only basic and linguistic skills but also self-development and respect for several aspects such as diversity and (inter)cultural awareness. Taking into account the perceptive and interpersonal abilities mentioned in reports on future skills, it seems that education will need further support for updated teaching practices and assessment of the skills that are expected to have greater demand, namely STEM. Institutions will need to update and promote the teaching of new skills based on a new collective and moral consciousness as recently indicated in OECD's (2018) Global Competence in order to make future citizens understand and act on issues of universal significance in today's interconnected world.

Originality/value – For several decades, government, education and industry have proposed different outlines for what graduates should know and be able to do. Limited academic studies have been found, however, with updated concrete data on which skills should preferably be developed or whether and how students can further improve these skills as part of EHEA credit student mobility. This study has synthesized works and identified domains which featured the importance of generic core, cognitive and employability skills. The revision of skill frameworks has underscored existing literature and reports on future skills which anticipate that, in order to confront the expanding and prevalent role of technology, graduates will need to focus on developing unique human skills such as effective communication and creative innovation, critical thinking and collective ethical values.

Keywords Skill frameworks, European higher education area (EHEA), Credit mobility, Employability

Paper type Research paper

1. Introduction

Education and industry have launched varied proposals for the development of skills that enable individuals to be productive members of society resulting in a multitude of frameworks and concepts which some authors have pointed out challenging to assess (Author 1 *et al.*, 2019).

Organizations and institutions such as the European Commission, the UNESCO or 21st Century Skills have defined skills and indicated key areas and broad education outcomes on which higher education should focus. Research studies on skills in the workforce carried out by the international OECDE (2017), the European CEDEFOP (2018) or Future Skills (2017) in the United States and the United Kingdom have utilized surveys of key constituents to determine what factors and skills are relevant for employers. Academic research has mainly focused on local or study cases (i.e. Barbosa *et al.*, 2017; Chadha, 2006), indicating how to develop future citizenship and cognitive skills (Wagenaar, 2018) in the European higher education area (EHEA), referring to the academic perspectives and the outcomes of outward student mobility (Bridger, 2015) or on the employability of specific skills (Pearson, 2017). Significant past studies have evaluated the effects of mobility on the skills and employability of students (Branderburg, 2014) and the impact of the Erasmus programme for evaluating skills (Jacobone and Moro, 2015). Recent literature presents a broad range of skill frameworks difficult to delimit (Suleman, 2018) which vary from the proposal of the development of cognitive skills to work-relevant competences. Most of these studies agree on the need of a "preliminary framework for decision making that educational leaders can use for the development of a common program" (Dragoo and Barrows, 2016, p. 73).

This paper aims to generate an outline and create a trans-national common understanding of the necessary skills developed through European credit mobility, conceived by the Commission as the limited period of study or traineeship abroad in the context of an ongoing academic study programme with the aim to obtain credits.

For this purpose and taking into account the diverse perspectives, it is n
identify which specific skills frameworks are essential in order to indicate strategies that may help develop them. Therefore, this study will consider the following research questions as a guide for exploration:

(1) To revise main conceptual frameworks applicable in higher education considering educational, institutional and occupational perspectives.

(2) To analyse key frameworks and determine the skills relevant in EHEA credit mobility programmes.

(3) To identify key domains and categorize skills among the examined schemes for appraisal.

In order to guarantee that a final emerging framework has a well-founded scientific basis, the theoretical review includes not only academic but also grey literature (government reports, policy statements and issue papers) in line with the first research question of this paper. This process consists of revising key international, European and local conceptual skills frameworks applicable in higher education from educational, institutional, occupational and mobility perspectives.

2. Literature review

2.1 Skills in higher education: relevant conceptual frameworks

Since the integration of the EHEA in the Bologna process, education has become more student-centred and the focus has shifted to the student's ability to acquire knowledge and develop new skills that may qualify them for the current and future demands of the labour market. Improving the key competences and skills of citizens is, therefore, a key goal of current education and training systems, and institutions have a responsibility to deliver deeper active learning experiences and skills-based training in meaningful ways (Becker *et al.*, 2017).

For both, the European and the international economy, skills are necessary for competitiveness and innovation, and in the higher demands of the knowledge society, young graduates need to further develop their skills (EC, 2012), which vary from basic skills such as reading, mathematics and science, to language and transversal skills such as information and communication technology (ICT), entrepreneurship and civic skills. Surveys reveal, however, that there is a skill shortage, mismatch or gap between the skills developed at universities and those which are required in the workplace pointing to the need for specific skills (Pouratashi and Zamani, 2019) or to the complementarity of transferable skills (CEDEFOP, 2018); and these can be attained in mobility programmes (Dvir and Yemini, 2017).

TA1 As already proposed in the Annex AI of the Council Recommendation on Key Competences for Lifelong Learning (EC, 2006), skills are those which individuals need for personal development, employability, social inclusion and active citizenship. The EC's Eurobarometer (2014) describes skills as cognitive, which involve the use of logical, intuitive and creative thinking, or practical, more related to physical agility and the use of procedures, materials and tools.

While sometimes used as synonyms, the terms skill and competence can be distinguished according to their scope. The term skill refers typically to the use of methods or instruments in a particular setting and in relation to defined tasks. This definition is comparable to the *European Qualifications Framework*, which understands skills as the ability to apply knowledge and use know-how to complete tasks and solve problems (Morselli and Ajello, 2016). The use of the terms skills and competences is, however, complicated and has not always been consistent in its use (Wagenaar, 2014, p. 36). The term competence is broader and refers typically to the ability of a person facing new situations and unforeseen challenges to use and apply knowledge and skills in an independent and self-directed way. Thus, in the literature (i.e. European Commission reports) we can find the concept of "skills" as a component of "competences" or at the same level together with "knowledge".

Similar to the broad concept of competence and skill, there is no consensus as to the definition of transversal, employability or transferable skills. Various typologies have been proposed, and designations for the concept have been put forward as revised by the

UNESCO (2014). According to Mansfield (2004), transferable skills are all the competences which are not technical, specific or occupational. Assister (1995) referred to transferable skills in higher education as the generic capacities which allow individuals to attain success in a wide variety of tasks and occupations. Harvey *et al.* (1997) suggested two categories of transferable skills: personal attributes and interactive attributes, which involve social relationships.

2.2 Academic studies on skills classifications

Barbos *et al.* (2017) carried out a theoretical review of the concepts of competences and skills and signalled various designations. As pointed out by these authors (2017), there have been different proposals from the 1990s which might have been taken into account in the Bologna process.

Woodruffe (1993) classified competences in two nuclei: (1) technical skills which are specific to the job and (2) generic skills, which can be universal or transferable. Stewart and Knowles (1999) suggested a similar frame: (1) key (or core) skills, which are the general skills required in the workplace and include basic literacy and numeracy, as well as a set of transferable personal skills, and (2) vocational skills, which refer to the skills needed for specific jobs or occupation groups. They are less general than key skills but can be transferred from a job in a specific area to another. (3) Job-specific skills are specific to a particular job or even an organization, also designated as technical skills.

Lawrence (2002) proposed a typology which has been adopted in the United States America: (1) academic skills; knowledge and skills associated with the academic disciplines of reading, writing, mathematics and science; (2) employability skills; used to perform effectively, which are transferable to a broad range of occupations; (3) Occupational and technical skills; specific technical and occupational knowledge and skills which are job-specific, such as knowledge of sales methods or database programming.

2.3 Grey literature on skills classifications

Similar to the EC (2006) proposals, UNESCO (2015) outlines those skills which are influenced by work-based learning and link training systems with the labour market and employability. Despite the UNESCO incorporating many definitions and categories from relevant institutions such as the CE, CEDEFOP, OECD and so on, the main classifications comprise foundation, transferable, transversal, technical and vocational skills as defined in Table I following UNESCO Global (2015). This classification is founded on the model adopted by the United Nations (2000) which contemplated core skills, core values and management skills. T1

Type	Definition
1. Essential or foundation skills	At their most elemental, foundation skills include the literacy and numeracy skills necessary for getting work that can pay enough to meet daily needs. These skills are also a prerequisite for continuing in education and training and for acquiring transferable and technical and vocational skills that enhance the prospect of getting a job
2. Transferable skills	Skills that can be introduced in a different socio-cultural or technical environment, or that can be used in other occupations
3. Transversal	Considered as not specifically related to a particular job, task, academic discipline or area of knowledge but as skills that can be used in a wide variety of situations and work settings. These skills are increasingly in high demand for learners to successfully adapt to changes and to lead meaningful and productive lives
4. Technical and vocational	Many jobs require specific technical know-how, from growing vegetables to using a sewing machine, laying bricks or using a computer

Table I. Skill definitions and categories

Source(s): Adapted from UNESCO/UNEVOC International Centre (2014)

In an open terminology format, ESCO (2013) has presented a multilingual online classification. This system categorizes European skills and competences, qualifications and occupations showing their relationships in order to facilitate cooperation among mobility students, systems and employers. To reduce ESCO's broad number of skills in a manageable number, this study will follow the EC project VALITS (2017) for the validation of the 347 most representative skills.

As explained by Griffin *et al.* (2012) in their assessment and teaching of 21st Century Skills (2012), which comprise skills, abilities and learning dispositions, economies have transformed and some specific skills, explicitly digital literacy, are in increasingly high demand together with those associated with deeper learning based on analytic reasoning. Following the traditional 21st Century Skills mentioned by these different organizations, Pearson's (2014) global index of cognitive skills and educational attainment highpoints that teaching basic skills is not enough and places the stress on non-cognitive skills. In their view, skills decline if they are not used regularly; lifelong learning can help to slow this rate though. The report stresses that technology alone does not help individuals nor develops new skills and calls developing countries on the efficient development of basic skills before investing further pedagogies and technologies.

In the context of the European Tuning project (González and Wagenaar, 2003; Waagenar, 2014, 2018), both generic and specific skills were analysed and associated to different areas of study identifying different skills according to relevance for employers, for their social dimension and by the disciplinary sector. The report specified the requirement and prior acquisition of instrumental and interpersonal skills to appropriately develop the systematic ones.

2.4 Skill frameworks relevant to the workforce

CEDEFOP's (2018) report coincides with previous studies on the need for a qualified workforce in technology with an impact on the demand for science, technology, engineering and mathematics (STEM)-related skills. The survey reported that foreign languages and basic skills are key to employment and social inclusion redefined by the ongoing digital revolution as new forms of reading and writing. Bakhshi *et al.* (2017) and Pearson's (2019) survey on Future Skills also rationalized that megatrends such as globalization, demographic and environmental changes, along with emerging technology, will have significant influence over the jobs of the future. This research, focused in the UK and USA contexts, convened how these tendencies could affect the future demand of the skills needed, stressing the importance of combining interpersonal and cognitive skills as stated by the 21st Century Skills (2012). Similarly, the OECD (2017, p. 78) recognizes individuals' skills in all their diversity, as fundamental determinants for occupational attainment, job performance and social success. It considers, however, that some relevant skills dimensions are measured imperfectly because there is always a gap between conceptualizing skills and assessing them.

2.5 Skills in European student mobility programmes

Mobility programmes can have a multitude of benefits for participating students (Brandenburg *et al.*, 2014). Bell (OECD, 2017) agrees that cognitive and professional skills can be improved through mobility programmes as they can develop a culture of lifelong learning with the support of EHEA institutions. Students not only mature during their mobility period, but they also gain in competences summarized as soft or key skills as specified in the Eurobarometer (EC, 2011, pp. 36–40). Additional positive benefits commonly attributed to student mobility are the development of language skills, self-efficacy and employability, feelings towards Europe and cosmopolitan orientation (Jacobone and Moro, 2015). The acquisition of these, together with employability and other transferable and job-

related soft skills, has been acknowledged to be promoted through higher education mobility programmes (Alfranseder *et al.*, 2012, p. 70).

As stated by Teichler (2012), ERASMUS represents the most popular scheme for student mobility at the European level and constitutes the flagship of all the educational programmes administered by the European Union. Despite some authors claiming that the main policy from this type of European-level initiatives was focused on "European" culture and values (Robertson, 2010, p. 26), the EC (2014, p. 33) has pondered that the first aim of student mobility is to support learners in the acquisition of competences (knowledge, skills and attitudes) with a view to improving their personal development and employability in the European labour market (Caparros-Ruiz, 2019) beyond focusing on the micro level of learners' personal skills and global competence (Yubal and Yemini, 2017, p. 9), which would justify the development of educational policies that promote international mobility.

Branderburg (2014) analysed in detail all these effects of mobility programmes from different perspectives and considered not only employability skills understood as "the broad range of skills and competences necessary to function in a working environment and to enable one to succeed in the workplace" (2014, p. 29), as well as real career and employment aspects, but also features related to social life and relationships from CEOE (2017, p. 73).

We agree with Wagenaar (2018) that existing literature and studies still argue which skills are more frequently required and relevant for academia, the students and the labour market in respect to European credit mobility. This results in the need to propose a manageable skills framework based on key international research studies for appraisal.

3. Method

The research methodology used in this study is based on Astalin's (2013) grounded theory for data collection. The expected skills outlined will emerge from the theoretical data revision and collection will follow a systematic process to identify, code and connect records.

To address the limitation of the published skill-based corpuses, we undertook a scoping review following Arksey and O'Malley's (2005). This method is mainly aimed at mapping findings rather than establishing the effectiveness of particular data and does not usually involve critical appraisal of study methodology or detailed extraction of outcomes. The five-stage scoping review includes: (1) identifying the research questions; (2) identifying relevant studies, (3) study selection; (4) charting the data and (5) collating, summarizing and reporting the results.

The approach used to identify related literature was a search in three main databases such as Scopus, Web of Science and Google Scholar for scientific and relevant articles after 1990 using the following combination of keywords: "skill frameworks" AND "higher education" OR "skill frameworks" AND "mobility exchange programs". It produced 391 articles. After examining the articles, we found that only 32 deal with skill frameworks in European higher education. After the review of these existing literature (summaries, tables and conclusions), we found out that most articles focused on specific skills (transferable, employable, etc.) in the EHEA, but merely 16 academic publications offered a complete depiction of skills frameworks. Most current accounts about skills outlines, specifically the ones related to employability, come from grey literature, namely comprehensive records and reports. These readings are presented in the Annex AII. TA2

3.1 Data categorization and analysis

The categorization involved coding the data obtained from the revision of literature on the different skill frameworks and introducing it in Excel spreadsheets to identify relationships between the different categories. The frequency and variability of mentioned skills found per

area were charted. As our purpose was to analyse domains relevant to European higher education student mobility, we only coded findings from each of these categories: educational, institutional, occupational and student mobility perspectives. Applicable relevant frameworks were assembled following Markle *et al.* (2013) according to: (1) *skills* in each domain related to knowledge, competences and abilities and (2) *domains*. After comparing and contrasting frameworks to determine common factors, six critical domains were identified: core, cognitive, transversal, transference, employability and other skills.

4. Results and discussion

The second research question consisted of analysing key frameworks and determining the skills relevant for EHEA credit mobility programmes and employability.

A skills matrix and table/infographic with the different categories, containing common skills identified in the analysis of the revised studies which are applicable in (1) higher education (n = 163), (2) relevant to the workforce (n = 26) and (3) meaningful in credit mobility programmes (n = 23) is presented in the Annex AIII The following data identify the skills which were mainly considered by all the studies revised in this research significant for higher education students to gather during their degree education in order to increase their knowledge and employability in credit mobility programmes. Note that a similar skill might belong to two or more categories at the same time but was mentioned in only one category for simplicity.

TA3

4.1 Review of key skills relevant to EHEA credit student mobility

T2 As presented in Table II, the analysis of data has revealed that 22.1 percent of the frameworks consulted conveyed ICT prevalence in its various forms. Since the past decades, information and communication technology – or digital skills – is considered as a key or core skill (Stewart and Knowles, 1999; UN, 2000; UNESCO, 2015), instrumental skill (Wagenaar, 2018) and transversal skill (ESCO, 2013). Pearson's (2014) and Griffin *et al.*'s (2012) assessments of 21st Century Skills (2012), however, have denoted ICT as just one subarea within the digital literacy skills taxonomy. Institutions analysing skills and job surveys consider ICT either as a cognitive skill (OECD, 2017) or as a fundamental skill CEDEFOP (2018) and propose several levels of attainment which vary from basic to advanced similar to the EC's (2010) digital competence. Branderburg *et al.* (2014) reported that ICT is a necessary skill for employability opposed to Bakhshi *et al.*'s (2017) and the EC's (2014) Eurobarometer.

Key organizations have also highlighted the communication skill in 19.1 per cent of the cases. Griffin *et al.* (2012) considered it a learning skill. Communication has been contemplated as a key or core skill besides an interactive and interpersonal or personal skill (Harvery *et al.*, 1997; Wagenaar, 2018 and ESCO, 2013, respectively). The workforce classifies communication as a transversal (CEDEFOP, 2018) and general cognitive skill (OECD, 2017) required for employability as in Branderburg (2014).

Learning skill was mentioned in 14.7 per cent of the documents reviewed and has been labelled in different forms. Considered a personal attribute for Harvey *et al.* (1997) or ESCO (2013), and a core skill for the UN (2000) and the UNESCO (2014), the four of them appealed for the need of continuous learning in education and beyond. Griffin *et al.* (2012) related this skill to innovation and Gonzalez and Wagenaar's (2003) Tuning Project to methodological aspects. The CEDEFOP (2018) considered it a transversal skill, whereas Bakhshi *et al.*'s (2017) highlighted the need to develop active learning strategies. Problem solving has been included in 14.7 per cent of the different frameworks and has been identified as an employability skill by Lawrence (2002) and by Branderburg (2014), as a transferable skill by UNESCO (2014) and CEDEFOP or as a learning skill in Griffin *et al.* (2012). ESCO (2013) considered problem

Table II.
Skill framework relevant for mobile credit students and employability

Domains	D1	D2	D3	D4	D5	D6
Skills	Basic/key core/global foundation/ fundamental skills	Cognitive/ learning skills	Employability/career and life skills/ management	Transferrable skills	Transversal skills	Other skills: Personal attributes instrumental vocational, organization interpersonal digital literacy methodological
ICT, digital literacy	A.2.1, A.3.1., A.6.1, B.1.1, C.2.3, A.8	B.2.1	C.1	A.2.1	A.9.2	A.9.2, A.7.2.
Communication	A.3.1, A.6.1 A.7.1, A.8.3 A.11.3	A.9.1.3 B.2.3	A.7.2, C.1.	A.5.2	A.7.3.2, B.1.2.1.	A.1.2, A.7.1, A.10.2 C.3
Learning strategies, Continuous Learning, Instruction	A.1.8, A.7.1.5 A.11.3	A.4.1, A.7.1 A.9.1. A.10. B.3.2.			B.1.2.5,	A.1.1
Problem solving	A.8.7	A.9.1.2, B.2.1.3 B.2.3.3		A.7.2.1	B.1.2.4,	A.3.2, A.10.1.2 A.11.1.8
	C.2	B.3.2,	C.1.2			
Creative, innovation and originality	A.6.1.6, A.11.3.2	A.5.1.3, A.9.1 A.9.1.5,6 B.2.3.3, B.3.2		A.7.2.3.	A.7.3.1 A.11.2.12	A.10.1.1. C.1.3, C.2.4
Ethics, loyalty integrity, tolerance, commitment, responsibility, trust	A.11.3.5,6 A.6.1.5 A.6.2 B.2.2		A.1.16 C.1		A.7.3.4	A.10.2.2 A.11.1.4.1 A.8.2.2 A.9.1

(*continued*)

Domains	D1	D2	D3	D4	D5	D6
Cultural interaction/ multiculturalism/Respect for diversity	A.1.2 A.6.2.3 A.11.3.9 A.9.3 C.1	B.2.3	A.9.3		A.7.3.4	A.10.2.1 B.1.1.5 B.2.2.
Planning and organization	A.3.1, A.6.1	B.2.3	C.1.4		A.7.3.2 B.1.2.6	A.10.1.2, A.11.1 C.1.5
Management	A.8.1,5	B.2.3	A.6.3			A.10.1, A.11.1.2
Literacy, Language, Foreign languages,	A.3.1 B.1.1 C.2	B.2.1	C.1.9 C.1.11		A.7.3.5 A.11.2.3	A.9.2.4
Team work	A.6.1, A.8.8			A.3.1.3	A.7.3.2 A.1.2.3 B.1.2.2.	A.3.2, A.10.2.1 A.11.1.11, C.3.2
Decision-making		B.3.2	C.1.1.1 A.6.3.5, A.9.3.2, C.1			A.3.2, A.10.1.2, A.11.1.9,
Numeracy	A.3.1.2, A.7.1, B.1.1, C.1.2	B.2.1	C.1.8			
Reflective, critical thinking, deductive reasoning, analysis	A.7.1.4 A.5.1,	A.5.1.3, A.9.1, A.10.1.1 B.2, B.3	C.1		A.7.3.1, A.11.2.6 A.11.2.7	A.10.2.2, A.10.2.2, A.10.3.1

Table II.

solving an organizational skill, whereas the Tuning Project (2003, 2014) described it as an instrumental and methodological skill. Classifications vary from cognitive (OECD, 2017; Bakhshi *et al.*, 2017) to key skill (EC's Eurobarometer, 2014). Creative, innovation and originality skills were regarded in 14.7 per cent of the frameworks. They were mentioned as cognitive core skills (EC, 2006; UN, 2000) and as transferable (UNESCO, 2015), instrumental (Tuning Project, 2003) and personal basic skills (ESCO, 2013) needed for learning and innovating by Griffin *et al.* (2012). Ethical and moral personal attributes such as loyalty, integrity, tolerance, commitment or responsibility were highly valued (13.2 per cent) by most of the revisions, specifically the OECD (2017).

Cultural, intercultural or adaptability skills signified for 11.8 per cent of the studies desired interpersonal core outcomes from graduate students and related them to interpersonal attributes (Tuning Project, 2003; Harvey *et al.*, 1997) or transversal citizenship skills (UNESCO, 2015) necessary for organization (ESCO, 2013), career and life (Griffin *et al.*, 2012). Planning and organization have been defined in 11.8 per cent of the cases as core skills (UN, 2000; ESCO, 2013), cognitive skills by the OECD (2017) and instrumental methodological skills by the Tuning Project (2013). The CEDEFOP (2018) has considered them transversal skills and Branderburg (2014) as a strategic requirement for employability. Management, in its different forms, (time management, performance management, conflict management, project management) was also considered in 10.3 per cent of the revised reports related to vocational (Stewart and Knowles, 1999; Bakhshi *et al.*'s, 2017; Tuning Project, 2003), management or organizational skills (UN, 2000; ESCO, 2013) and employability (Branderburg, 2014).

Linguistic and language skills have been appraised in 8.8 per cent of the researched papers and considered instrumental skills by Gonzalez and Wagenaar's (2003) Tuning Project and a transversal skill by ESCO (2013). The Erasmus impact study (Brandenburg, 2014) highly pondered foreign language skills due to the European diversity. Teamwork was pointed out by 8.8 per cent of the studies in different frames: as an interactive (Harvey *et al.*, 1997) core skill (Stewart and Knowles, 1999; UN, 2000) or an employability skill (Lawrence, 2002; EIS, 2014) and transversal (UNESCO, 2014; CEDEFOP, 2018), interpersonal (Tuning Project, 2003; EC's Eurobarometer, 2014) organizational skill (ESCO, 2013). It has been also incorporated in Pearson's Global Index (2014). Reflective and critical thinking skills have been cogitated by a similar number of studies (8.8 per cent). They are mentioned as deductive reasoning, which were considered transversal skills (ESCO, 2013; UNESCO, 2014) and are also linked to ethical consciousness in the Tuning Project (2003). System analysis seems meaningful to Bakhshi *et al.*'s (2017) Future Skills as an arm-hand steadiness feature.

Decision-making, mentioned in 7.4 per cent of the cases, was classified as a vocational sill by Stewart and Knowles (1999) and as a management and employability skill by the UN (2000) and the EIS (2014). Gonzalez and Wagenaar's (2003) Tuning Project and ESCO (2013) considered it as a methodological and organizational skill. Numeracy was highlighted in a lesser number of studies (7.4 per cent) than the previously mentioned linguistic skill, but was regarded as a basic fundamental skill (Stewart and Knowles, 1999; UNESCO, 2014; CEDEFOP, 2018; Branderburg, 2014) as well as a cognitive skill (OECD, 2017) needed for employability.

Further skills considered in 5.9 per cent of the researched papers included adaptability, leadership, cooperation, collaboration and coordination. Depending on each specific definition, they were mainly considered by the EC's Eurobarometer (2014) for employability as transferable management or a job-specific skill (OECD, 2017; UN, 2000; ESCO, 2013; Pearson, 2014; UNESCO, 2014). Skills related to the "self" (self-confidence, self-motivation, self-confidence, self-discipline or self-direction), understood by 5.9 per cent of the publications as the individual distinction from one's interpersonal or social roles, were considered personal attributes by Harvey *et al.* (1997), and core skills related to transversal

skills such as interpersonal and critical thinking needed for career and life skills (Griffin *et al.*, 2012).

Marketing, sales, accounting, customer handing, customer orientation and entrepreneurship appeared in up to 4.4 per cent of the accessed reports. Although it depends on each specific description, these skills were associated to United Nations' (2000) core and management skills and ESCO's (2013) organization and transversal job-specific skills. Entrepreneurship was additionally considered in Pearson's (2014) global index and as a transferable skill (UNESCO, 2014). Social interaction, social perceptiveness and flexibility were considered emotional and personal traits in OECD (2017) and interpersonal skills were needed for cooperation in the Tuning Project (2013). Bakhshi *et al.*'s (2017) Future Skills required for career and life as well as in the Griffin *et al.* (2012) assessment of 21st Century Skills. Flexibility was also considered an organization skill in ESCO (2013). Professionalism and initiative skills were regarded by ESCO (2013) and UN (2000) as career and life skills, which represented a 3 per cent of the revised documents likewise reading and writing core academic skills (2.9 per cent), which were reflected just by Lawrence (2002) and the UNESCO (2014).

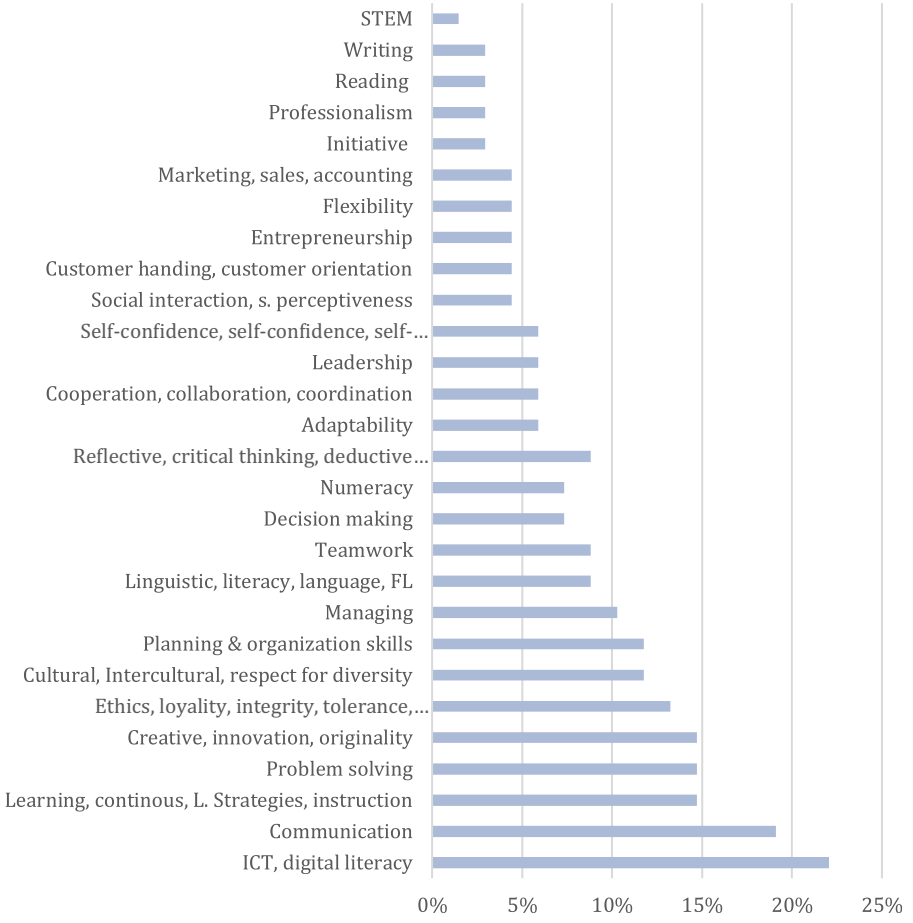

Figure 1.
Skills relevant to EHEA credit student mobility

Other skills mentioned only once in the revised papers were mainly related to ESCO's (2013) transversal and job specific skills (work under pressure, goal orientation), career and life skills (productivity), cognitive skills (intuition) and interpersonal skills (conflict management). The skills expected to be attained by people with a tertiary-education level degree in the subjects of STEM were merely included in OCDE (2017) skills framework.

4.2 Categorizing skills in EHEA credit student mobility

The third aim of this paper consisted of identifying and categorizing key skill domains and common areas from the educational, institutional and occupational perspectives.

As a result of examining the different studies, 14 relevant skills (ICT, communication, learning, problem solving, creativeness, ethics, cultural, organization, management, critical thinking, language, teamwork, decision-making and numeracy) were identified in six common domains: core, cognitive, employability/career, transferable, transversal and others (personal attributes, instrumental, vocational, organizational, interpersonal, digital literacy). The most relevant skills for (1) European higher education, (2) degree mobility programmes and (3) employees are classified and referenced in Figure 1 according to the studies revised in the Annex. Note that only skills performing over 5.9 per cent have been considered significant in this framework.

Data have confirmed that there is scarce agreement on a common taxonomy of skills. However, considering the results presented in the aforementioned table, which summarize relevant educational, institutional and occupational perspectives, it can be noticed that there is consensus on the classification of only four skills: ICT, literacy and numeracy, which are considered basic, key or core skills in most researched papers together with problem solving, which is generally regarded as a cognitive skill.

As it can be observed, the general tendency is that policymakers and academia focus on some particular domains (*D*): basic/key, core/global foundation/fundamental skills (*D*1), transferable (*D*5), transversal and other skills (*D*6). Studies analysing the workforce skill requirements have projected mainly cognitive and learning skills (*D*2), whereas mobility programmes concede relevance to employability, management, career and life skills (*D*3).

5. Conclusions

For several decades, government, education and industry have proposed different outlines for what graduates should know and be able to do. Scarce academic studies have been found, however, with updated concrete data on which skills should preferably be developed or whether and how students can further improve these skills as part of EHEA credit student mobility. This study has synthesized works and identified domains which featured the importance of generic core, cognitive and employability skills.

The revision of skill frameworks has underscored existing literature and reports on future skills which anticipate that, in order to confront the expanding and prevalent role of technology, graduates will need to focus on developing unique human skills such as effective communication and creative innovation, critical thinking and collective ethical values. Data seem to confirm that a sole degree does not guarantee success, but the maturity of these skills and the commitment to lifelong learning. This can be strengthened by taking part in EHEA credit student mobility that has proved to improve not only basic and linguistic skills but also self-development and respect for several aspects such as diversity and (inter)cultural awareness.

Taking into account the perceptive and interpersonal abilities mentioned in reports on future skills, it seems that education will need further support for updated teaching practices and assessment of the skills that are expected to have greater demand, namely STEM.

Institutions will need to update and promote the teaching of new skills based on a new collective and moral consciousness as recently indicated in OECD's (2018) Global Competence in order to make future citizens understand and act on issues of universal significance in today's interconnected world.

Research has suggested that education systems will have to adapt to the changing needs of the labour markets' reshaping roles to balance technology and human intellect. The workforce seems to realize that cognitive skills such as problem solving, organization and decision-making are needed in today's society; advanced basic learning skills such as numeracy and literacy are essential. Findings appoint to new areas for exploration in skills development in order to prepare European higher education students for current trends in the Fourth Industrial Revolution and the fusion between digital, physical and biological spheres.

Notwithstanding, measuring skills involves limitations as records vary depending on continuous emerging data from institutions, occupations and education. The key frameworks surveyed have provided a representative classification and depiction of the current skills from specific perspectives which are also believed to have their shortcomings. In combination, however, it is believed that the results presented can help provide a theoretical basis for assessing skills in credit mobility and Erasmus programmes within the EHEA.

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Appendix

Annex AI.
Review of skills key frameworks relevant to higher education

Revision	Skill classification
1. Harvey *et al.* (1997)	1.1 Personal attributes
	1.1.1. Knowledge
	1.1.2. Continuous learning
	1.1.3. Flexibility
	1.1.4. Adaptability
	1.1.5. Self-regulation
	1.1.6. Self-motivation
	1.1.7. Self-confidence
	1.2. Interactive attributes
	1.2.1. Communication
	1.2.2. Relationships
	1.2.3. Group work
	1.2.4. Ability to influence others
2. Woodruffe (1993)	2.1 Technical skills
	2.2. Generic skills
	2.2.1. Universal skills
	2.2.2. Transferable skills
3. Stewart and Knowles (1999)	3.1 Key (or core) skills
	3.1.1. Literacy
	3.1.2. Numeracy
	3.1.3. Transferable personal skills:
	a. Teamwork
	b. Communication
	c. Self-motivation
	d. Organization
	e. ICT
	3.2. Vocational skills
	3.2.1. Teamwork
	3.2.2. Decision-making
	3.2.3. Problem solving
	3.3. Job-specific/technical skills
4. Lawrence (2002)	4.1. Academic skills
	4.1.1. Reading
	4.1.2. Writing
	4.1.3. Mathematics
	4.1.4. Science
	4.2. Employability skills
	4.3. Occupational and technical skills
	4.3.1. Job-specific skills
5. EC (2006)	5. 1. Cognitive skills
	5.1.1. Logical
	5.1.2. Intuitive
	5.1.3. Creative thinking
	5. 2. Practical skills
	5.2.1. Manual dexterity
	5.2.2. Use of methods and materials, tools and instruments

(*continued*)

Revision	Skill classification
6. United Nations (2000)	6.1 Core skills
	6.1.1. Communication
	6.1.2. Teamwork
	6.1.3. Planning
	6.1.4. Organization
	6.1.5. Responsibility
	6.1.6. Creativity
	6.1.7. Customer orientation
	6.1.8. Continuous learning
	6.1.9. ICT
	6.2 Core values
	6.2.1. Integrity
	6.2.2. Professionalism
	6.2.3. Respect for diversity
	6.3 Management skills
	6.3.1. Leadership
	6.3.2. Development of others
	6.3.3. Confidence building
	6.3.4. Performance management
	6.3.5. Decision-making
	6.3.6. Judgement
7. UNESCO (2014)	7.1. Foundation skills
	7.1.1. Reading
	7.1.2. Numeracy
	7.1.3. Oral communication
	7.1.4. Thinking skills
	7.1.5. Continuous learning, document use
	7.1.6. Writing
	7.1.7. Working with others
	7.1.8. Computer use
	7.2. Transferable skills
	7.2.1. Problem solving
	7.2.2. Communication of ideas and information effectively
	7.2.3. Creativeness
	7.2.4. Leadership and conscientiousness
	7.2.5. Entrepreneurship
	7.3. Transversal skills
	7.3.1. Critical and innovative thinking
	7.3.2. Interpersonal skills (e.g. presentation and communication skills, organizational skills, teamwork, etc.)
	7.3.3. Intrapersonal skills (e.g. self-discipline, enthusiasm, perseverance, self-motivation, etc.)
	7.3.4. Global citizenship (e.g. tolerance, openness, respect for diversity, intercultural understanding, etc.)
	7.3.5. Media and information literacy
	7.4. Technical and vocational skills
8. Pearson's global education index (2014)	8.1. Leadership
	8.2. Digital literacy
	8.3. Communication
	8.4. Emotional intelligence
	8.5. Entrepreneurship
	8.6. Global citizenship
	8.7. Problem solving
	8.8. Team working

(*continued*)

Annex AI.

Revision	Skill classification
9. Griffin *et al.* (2012) 21st Century skills	9.1. Learning and innovation skills 9.1.1. Critical thinking 9.1.2. Problem solving 9.1.3. Communications 9.1.4. Collaboration 9.1.5. Creativity 9.1.6. Innovation 9.2. Digital literacy skills 9.2.1. Information literacy 9.2.2. Media literacy 9.2.3. ICT 9.2.4. Literacy 9.3 Career and life skills 9.3.1. Flexibility 9.3.2. Adaptability 9.3.2. Initiative 9.3.3. Self-direction 9.3.4. Social 9.3.5. Cultural interaction 9.3.6. Productivity 9.3.7. Accountability
10. Gonzalez and Wagenaar (2003), Wagenaar (2018) The European Tuning Project	10.1. Instrumental skills 10.1.1. Cognitive a. Analytical b. Critical c. Reflective d. Creative 10.1.2. Methodological a. Time management b. Problem-solving c. Decision-making d. Learning e. Strategies f. Planning 10.1.3. Technological 10.1.4. Linguistic 10.2 Interpersonal skills 10.2.1. Social interaction and cooperation a. Interpersonal communication b. Teamwork c. Conflict management d. Negotiation 10.2.2. Critical and ethical consciousness 10.3. Systemic skills 10.3.1. Global analysis and understanding 10.3.2. Application of skills and knowledge to different situations

Annex AI. (*continued*)

Revision	Skill classification
11. ESCO (2013)	11.1. Organization skills
	11.1.1. Organization
	11.1.2. Planning
	11.1.3. Adaptability
	11.1.4. Ethics
	11.1.5. Professionalism
	11.1.6. Project management
	11.1.7. Flexibility
	11.1.8. Problem solving
	11.1.9. Decision making
	11.1.10. Time management
	11.1.11. Team working
	11.2. Transversal, job-specific skills
	11.2.1. Management skills
	11.2.2. Computer skills
	11.2.3. Language skills
	11.2.4. Marketing and sales skills
	11.2.5. Leadership
	11.2.6. Critical thinking
	11.2.7. Analytical skills
	11.2.8. Customer service skills
	11.2.9. Business and strategic skills
	11.2.10. Goal orienteers
	11.2.11. Work under pressure
	11.2.12. Innovation
	11.3. Personal basic skills
	11.3.1. Communication skills
	11.3.2. Creativity
	11.3.3. Interpersonal skills
	11.3.4. Emotional intelligence
	11.3.5. Loyalty
	11.3.6. Commitment
	11.3.7. Learning to learn
	11.3.8. Entrepreneurship
	11.3.9. Multicultural skills

Annex AI.

Revision	Skills classification
1. CEDEFOP (2018)	1.1. Fundamental
	1.1.1. Basic literacy
	1.1.2. Advanced literacy
	1.1.3. Basic numeracy
	1.1.4. Advanced numeracy
	1.1.5. Basic ICT
	1.1.6. Moderate ICT
	1.1.7. Advanced ICT
	1.2. Transversal
	1.2.1. Communication skills
	1.2.2. Teamwork skills
	1.2.3. Customer handing skills
	1.2.4. Problem-solving skills
	1.2.5. Learning skills
	1.2.6. Planning and organization skills
	1.3. Technical
2. OECD (2017)	2.1. Cognitive skills
	2.1.1. Literacy
	2.1.2. Numeracy
	2.1.3. Problem solving in ICT
	2.1.4. ICT
	2.1.5. STEM
	2.2. Noncognitive /soft skills/social and emotional skills/ personal traits
	i. Readiness to learn
	ii. Conscientiousness
	iii. Job engagement
	iv. Adaptability
	v. Cultural diversity
	vi. Trust
	2.3. General cognitive skills
	2.3.1. Interacting
	2.3.2. Communicating
	2.3.3. Creative problem solving
	a. Self-organization
	b. Managing
	c. communication
	d. Marketing
	e. accounting
3. Bakhshi *et al.*'s (2017) Future skills	3.1. Interpersonal
	3.2. Cognitive skills
	UK
	a. Judgment and decision making
	b. Fluency of ideas
	c. Active learning
	d. Learning strategies
	e. Originality
	f. Systems evaluation
	g. Deductive reasoning
	h. Complex problem solving
	i. Systems analysis
	j. Monitoring
	USA
	k. 1. Learning strategies
	l. 2. Psychology
	m. 3. Instructing
	n. 4. Social perceptiveness
	o. 5. Sociology and anthropology
	p. 6. Education and training
	q. 7. Coordination
	r. 8. Originality
	s. 9. Fluency of ideas
	t. 10 Active learning

Annex AII.
Skill frameworks relevant to the workforce

Revisions	Skills classification
1.Branderburg *et al.* (2014) Erasmus Impact Study (ESN)	1. Employability 1.1. Team work 1.2. Analytical and problem solving 1.3. Sector-specific skills 1.4. Planning and organizational 1.5. Communication 1.6. Adaptation to new situations 1.7. Decision-making 1.8. Numeracy 1.9. Foreign language 1.10. ICT 1.11. Literacy 1.12. Confidence 1.13. Curiosity 1.14. Decisiveness 1.15. Serenity 1.16. Tolerance 1.17. Vigour 2. Basic skills 2.1. Literacy 2.2. Numeracy 2.3. ICT 3. Interpersonal skills 3.1. Communication 3.2. Team work innovative/creative 3.3. Commercial/entrepreneurial skills 4. International orientation 5. Strategic and organizational
2. EC' Eurobarometer (2014)	Soft /key skills Intercultural awareness, adaptability, flexibility, Innovativeness Productivity Motivation Endurance Problem solving Cooperative work Foreign language skills

Annex AIII.
Skills developed in European student mobility programs